

## REMARKS

Applicants respectfully request reconsideration of the rejection of a number of claims, as amended without the addition of new matter. Claims 1, 2, 4, 5, 7, 10, 13-16, 18-34, 36-41, 42-57, 58-65 and 67-70 are active at the present time, claims 3, 6, 8, 9, 11, 12, 17, 35 and 66 have been cancelled without prejudice, and claims 71-113 are currently withdrawn as a result of the prior restriction requirement.

Information Disclosure Statement – The article by Katys et al in Russian has been fairly represented in the Office action. Applicants can provide a partial or full translation, if requested. The article is an early example of the use of non-birefringent media in polarization interferometry.

Claim Objections – Parent claim 58, and also claims 59-64 dependent therefrom previously erroneously referred to delay line elements at lines 8 and 9, and this has now been corrected to specify the input waveplate array "which precedes the" intermediate polarization beam splitter.

Claim Restrictions – 35USC§112 – Parent claim 1 was objected to as lacking terminal punctuation, as was claim 9 specifically and dependent claims 2-8 and 10-23 by inference. These claims have been corrected by the present amendment. Claims 68-70 erroneously used a term "n" which should have been "L", another error which has been corrected by amendment.

Rejection under 35USC§102(b) – Claims 1, 14 and 16 – As originally filed these claims were rejected on the reference to Cimini Jr. et al which contains an example of a birefringence simulator used in a special test circuit for polarization-insensitive frequency shift keying.

Claim 1 has been amended to make clear that the context of the present application is much more demanding and relates to the shaping of bandpass characteristics in a multiple wavelength system.

Rejection under 35 USC§102(e) – Claims 1, 10-12, 14, 16 and 65 were also rejected under §102(e) on the Bin Zhao reference U.S. Patent Application Publication No. US 2002/0048424A1 (*Zhao '424*). Detailed consideration of the Cumini Jr. reference, the Katys et al article cited in the IDS and other art including Bin Zhao's other published application U.S. 2002/0048024 (which is referenced in Bin Zhao '424) resulted in a determination to consolidate and focus the of claims and concentrate on the principal objective, namely the development of improved systems for controlling bandpass filter functions in the WDM systems. Consequently, claim 1 has been substantially augmented and claims 14 and 16 have been made dependent from a significantly modified parent claim 13. As to claim 1 as amended, it now refers to "modifying the transmission characteristics" of an input optical beam "having multiple wavelength to provide periodically spaced passbands" in which the differentially delayed beams are passed through half and quarter waveplates in the beam paths which are" positionable at angles tuning the bandpass characteristics of the system". This language is essentially based on the features held to be allowable in the Office action, and it is submitted to be allowable.

As to the other claims rejected on Bin Zhao's '424 under 35USC§102(e) only claims 10-12, dealing with systems having separate delay stages, need be considered here. Claims 14 and 16 are now dependent from claim 13, and will be considered in conjunction with that claim. Claim 65 has been amended to include allowed claim 66, which has been cancelled.

Claim 10 has been amended to be independent. The multiple stages specified therein operate to employ delay relationships and phase tuning in much more versatile and productive ways than feasible with Bin Zhao. Paragraph [0068] of that reference teaches nothing about the use of a "half-wave plate for tuning of a filter function, since it is concerned only with polarization directions. Moreover, applicants cannot find, in the Bin Zhao '424 any basis for the statement on page 5 that "delays are provided as integer multiples of the same delay,  $\Gamma$ ". Paragraphs [0076] to [0083] of Bin Zhao '424, are concerned with phase angle adjustment relative to polarization, and say nothing evident relative to the use of different differential delays within a stage. Claims 11 and 12 have been incorporated in now independent claim 10 and provides further patentable distinctions as to time delay differences which are integer multiples of a selected value, and waveplates variable in angle for tuning transmission characteristics.

As to claim 10 as amended it is also to be noted that there is a fundamental distinction between the multiple stages set out in the present application and the simple repetitive stages disclosed in the Bin Zhao reference. In the reference, the stages are essentially alike and cannot provide periodicity or phase variations such as to achieve flattened bandpass characteristics, or effect other types of transfer function modifications.

#### Rejection of Claims under 35USC§103

Claims 7, 8, 34-39 and 68-70 have been rejected as obvious over Bin Zhao.

In response, applicant has consolidated claims 7, 8 and 9 into amended claim 7, dependent from claim 1 as amended. In addition to the distinctions of claim 1, claim 7 now specifies the very precise lengths of the first and second beam splitters, and the use of  $\text{YVO}_4$  material in the beam splitter. It is submitted in response to the position in the

Office action, selection of the  $\text{YVO}_4$  material is not merely a matter of routine choice.  $\text{YVO}_4$  not only has optical properties that are needed, but thermal and mechanical properties which enable the splitters to be mounted in structures without being distorted by temperature induced stresses.

Claims 34-39 were rejected on Bin Zhao, the reference at p. 6 to claim "30" here being assumed to be in error. Claim 34 has been amended without new matter to incorporate the further specification of the non-birefringent element as having different selected indices of refraction which differ "by more than 15%" being of "glass and of substantially equal lengths accurate to within  $\pm 1$  micron of calculated lengths". This gives, as stated, "a precise relative retardation for the desired filtering function". These distinguishing features are not mere matters of choice and design, but based upon extensive development of the mathematical theory, and practical developments for beyond the sketchy and repetitive proposals of Bin Zhao. He simply proposes, in paragraphs [0050] to [0053] using a material having "temperature stability", or inserting some other material having "desired optical thermal and/or mechanical properties" into "at least the longer of the two paths" [0054]. Because parent claim 34 specifies that the lengths must as well be securely matched to within  $\pm 1$  micron the delay differential must be created by interrelating all optical and mechanical factors which affect optical path length. Bin Zhao refers to using different physical path lengths or "alternatively" different indices of refraction [0026] but appear to contribute nothing about using these factors together and also achieving an athermal performance. Bin Zhao offers no specifics which would help to solve this complex problem.

Claims 68-70 were also rejected as obvious over Bin Zhao, based on Bin Zhao's reference to the use of multiple stages. Claims 68-70 are, however, now dependent from amended parent claim 65 which is, as amended, submitted to be allowable, since it incorporates the phase tuning feature from dependent claim 66 deemed allowable in the last Office action. It is also noted that claims 68-70 specify the use of stages based on multiples of length L, corresponding to an interleaver with 100 GHz spacing. Bin Zhao merely mentions different channel spacing standards (12.5 GHz, 25 GHz, etc.) not how different delays would be used with stages.

Claims Rejected as Obvious on Bin Zhao and Shirasaki 5,982,483

Claims 2-6, 15, 17-19 were rejected under 35USC§103(a) as unpatentable over Zhao and Shirasaki. Claims 2, 4 and 5 are resubmitted, since parent claim 1 has been amended, with claims 3 and 6 cancelled. These three claims specify that the delay lines have substantially like "thermal expansion coefficients" and "athermal time delay difference characteristics...over a selected range of temperature variations." Claim 4 is now dependent directly from claim 1 and further recites that the first and second glass elements provide the chosen time delay by having "approximately the same physical length and different optical indices of refraction". Claim 5, which incorporates cancelled claim 6 sets forth that the "difference in the index of refraction is in excess of about 15%" with the first glass having an index of refraction of about 1.5" while the second has an index of refraction of about 1.9.

As previously argued, the recited features as to geometries and relationship are not obvious merely because of statements of a precatory nature as to how things might be done, without any guidance as to rules to follow, or how it should be done. The claimed

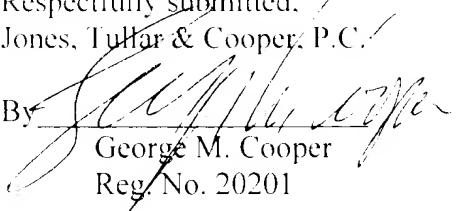
combination discloses how a very compact, efficient, and stable group of microelements can operate as an interleaver meeting the demanding requirements of modern optical communications. Thus the claims are submitted to be clearly non-obvious, and patentable over Bin Zhao. The secondary reference (Shirasaki) teaches how an added optical element can be used to compensate for changes in optical path length with temperature, but this is not a feature being claimed except in terms of differential delay.

Claim 17 having been cancelled the only remaining question is as to the rejection of claims 18 and 19, which are directed to a microoptic element for modifying the transmission characteristics of an input optical beam back on first and second optical delay lines comprising a number of optical delay lines in "cascading stages" and the stages include means "responsive to the polarization of the beams for canceling the dispersion slope and providing substantially constant dispersion". In dependent claim 19, this is further recited as "means in association with the stages is controlling the polarization vector signals to the stages". It is pointed out respectfully that Bin Zhao at Para. [0071] merely mentions that operational characteristics such as "dispersion", transmission and phase distortion are determined by birefringence values. He recognizes that dispersion exists, but provides no solution for minimizing or eliminating dispersion, and particularly in the usage of polarization vector angles. Consequently it is submitted that claims 18 and 19 are patentable.

Allowable Subject Matter – Applicants recognize and are appreciative of the care given to analysis of the application and the referenced cited, and particularly appreciate the recitation of allowable subject matter and the reasons for indications of allowability given on pages 11 and 12. In the light of the above considerations it is respectfully submitted

that claims 1, 2, 3, 5, 6, 10, 13-33, 34, 36-65 and 67-70, as amended are now allowable, claims have been held allowable or allowable if amended, to overcome technical deficiencies.

Art Cited but not Applied – The prior art cited in the record but not employed as a reference has been reviewed and is not considered to apply.

Respectfully submitted,  
Jones, Tullar & Cooper, P.C.  
By   
George M. Cooper  
Reg. No. 20201

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P.O. Box 2266 Eads Station  
Arlington, VA 22202  
(703) 415-1500